4.0 SYNOPSIS OF CAUSAL ANALYSIS

A causal analysis was performed by the FDH Radiation Protection organization and PHMC contractor personnel to determine the root, direct, and contributing causes for the 200 East Area contamination event and determine judgments of need to prevent the conditions leading to each cause. (The complete causal analysis with further explanation is included as Appendix D.) The root cause is the cause that, if corrected, would prevent recurrence of this event condition and similar conditions. A contributing cause is one that facilitated or promoted an occurrence but, by itself, would not have caused the occurrence. Correction of any contributing cause would not necessarily prevent recurrence of the event.

The event was the spread of radioactive contamination outside the radiologically controlled area in the 200 East Area, which resulted in identification of minimal offsite contamination. The direct cause of the event was the spread of contamination from the 241-ER-152 Diversion Pit by flying insects to controlled and uncontrolled areas in or near the 200 East Area. The root cause was inadequate processes to prevent biological vectors (fruit flies) from spreading contamination outside radiologically controlled areas (contamination areas). Several contributing causes were involved, including the application of a glycerin/monosaccharide (simple sugar)-based contamination fixative and the Site processes and surveillance.

4.1 DISCUSSION

On the Hanford Site, radioactive material present in the facilities, tanks, process equipment, underground waste sites, and contaminated surfaces is contained in posted radiological areas. These posted radiological areas are located within areas of the Hanford Site that are further controlled for radiological purposes. It is the PHMC policy that all personnel, equipment, and material leaving any posted radiological area containing contamination or any airborne radioactivity area is surveyed for radiological contamination, to the limits that allow uncontrolled release to anywhere on or off the Hanford Site. Barriers, work processes, and surveillance, both routine and event generated, implement the PHMC policy that there will be no contamination spread outside of posted radiological areas.

On September 28, 1998, surface contamination was identified in and outside of an office/change trailer (the MO-967 Mobile Office) in the area immediately south of the B Plant/WESF facility. The finding of contamination outside a posted radiological area initiated vigorous investigations, surveys, and mitigation actions. In the next days and weeks, contamination was identified primarily in the area south of B Plant/WESF, but also in some locations outside the controlled areas of the Site. In addition, minimal amounts of contamination were identified off Site in the City landfill and on socks in the home of a Site ironworker.

On October 8, 9 days after it began, the investigation identified the primary source of the radioactive material to be the high contamination on the inside surfaces of the 241-ER-152 Diversion Pit in the underground waste transfer system. The pit is located several hundred meters south of the B Plant/WESF facility. Work had been performed in an open-top enclosure surrounding the pit in the middle of September. Fixatives had been applied to the contaminated

surfaces of the pit to help keep contamination from becoming airborne when work disturbed the surfaces. This particular fixative is a purchased product and consists of a monosaccharide (simple sugar) and glycerin in a water solution. This material has been used for 2 years at the Hanford Site without this problem being identified; however, during this application the material attracted or, at least, provided a food source for fruit flies. There are indications that the fixative may have fermented during storage and handling before it was applied and may have become more of a biological attractant. No indication has been found that the manufacturer or anyone using this fixative at the Hanford Site performed a formal study of the potential of the material to attract or support biota.

Flying insects were able to breed in the contaminated diversion pit; then they transferred contamination out of the posted radiological area surrounding the pit to the surfaces of the structures and materials in the surrounding areas within flying range. The flying range could be extended, depending on prevailing winds. Attracted to moisture or organic food substances in kitchen and eating areas or on windowsills, and to garbage in the dumpsters, the flying insects spread contamination directly to controlled and uncontrolled areas of the Site. As a contamination-spread vector, fruit flies had not been previously identified within the DOE complex.

Once contamination had spread undetected outside the posted radiological areas, Site movement of materials (examples: refuse and garbage delivery to the landfill, transport of work and personal objects) spread contamination to uncontrolled areas of the site and offsite. The mechanisms of contamination spread are discussed further in Appendix B, Section B2.5, and Appendix D, Section D3.3.

The process of delivering Site refuse to an offsite landfill and the radiological control surveillance of this process was examined.

The process of protecting contaminated Site facilities from biological intrusion and the radiological surveillance of contamination spreads caused by biological transport vectors was examined.

4.2 ROOT CAUSE

Inadequate processes to prevent contamination via biological vectors (fruit flies) from spreading contamination outside of radiological areas (contamination areas). Judgment of Need: Strengthen the implementation of existing administrative and engineering radiological controls, and establish new programs and processes to identify all potential vectors (including biological) and prevent the spread of contamination.

DIRECT CAUSE

Flying insects (fruit flies) spread contamination from the 241-ER-152 Diversion Pit to controlled and uncontrolled areas in or near the 200 East Area. Judgment of Need: Prevent accessibility of flying insects to contaminated work locations (i.e., open containment) and prevent attractant conditions (i.e., fermentation, moisture, nutrients).

4.3 CONTRIBUTING CAUSES

- The contamination fixative solution used on the 241-ER-152 Diversion Pit is suspected of attracting fruit flies. The fixative, in the conditions in which it is used in the field, has not been evaluated to see if it is an animal attractant. No analyses of the fixative solution are available in all the environmental conditions of its use on the Hanford Site. Without analyses, no procedures have been developed for its use and storage under field conditions. Judgment of Need: The use of monosaccharide-based fixatives was discontinued in October until it can be demonstrated that in anticipated use and storage, they are not an animal attractant.

- No procedure exists to interdict refuse service when contamination is detected in the refuse or in refuse-handling containers. The group that manages Transportation Operations was not promptly notified so that they could determine if the contents of other Site dumpsters might be contaminated. Judgment of Need: A system should be established to notify Transportation Operations of any suspect contamination that inadvertently may have been picked up. A method should be established for controlling or determining the contamination level of refuse in dumpsters before the refuse is moved off Site.

- No policy is in place establishing routine surveys of areas with past known contamination spreads caused by biological transport vectors. The early August 1998 communication from the B Plant/WESF radiological control organization to the Site services organization was informal and initiated the daily surveys of the MO-967 Mobile Office. Judgment of Need: A policy should be established requiring routine surveys of areas with past known contamination spreads caused by biological transport vectors.

- The current policy of protecting contaminated facilities from biological intrusion does not provide for a proactive review of potential intrusion points with preventive and corrective actions. Judgment of Need: Routine surveillance of contaminated facilities and systems with the potential for biological intrusion should be incorporated into facility operations and maintenance.

- The PHMC team has not adequately integrated Sitewide biological control since the change from a Sitewide management and operations-type contract. Judgment of Need: Biological control should be better integrated among contractors. The roles and responsibilities of biological control at the Hanford Site need to be clarified.

- No policy is in place to prevent animal encroachment at refuse collection points. Animals in search of food are attracted to dumpsters, gaining access through openings. Judgment of Need: Establish requirements to keep dumpsters closed when not in use and to install access guards or screens on the bottom drainage openings.

- No policy is in place to minimize the presence of food substances near known contamination areas. Judgment of Need: Evaluate the need for requirements to control food substances, including refuse, entering areas near known sites with contamination spread potential.